

Translation

PATENT COOPERATION TREATY

PCT/EP2003/008479



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference B02/0101PC	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP2003/008479	International filing date (<i>day/month/year</i>) 31 July 2003 (31.07.2003)	Priority date (<i>day/month/year</i>) 01 August 2002 (01.08.2002)
International Patent Classification (IPC) or national classification and IPC B01J 31/20, 37/04, C07C 51/12, 51/10, 67/37, C07D 305/12, 303/04		
Applicant BASF AKTIENGESELLSCHAFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 27 February 2004 (27.02.2004)	Date of completion of this report 28 July 2004 (28.07.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP2003/008479

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
 pages 1-13, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☒ the claims:
 pages _____, as originally filed
 pages _____, as amended (together with any statement under Article 19
 pages _____, filed with the demand
 pages 1-6, filed with the letter of 14 May 2004 (14.05.2004)
- ☐ the drawings:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/JP 03/08479

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments):*

Continuation of : I.6

1. Amended claims 1-6, which are derived from the combination of the original claims 1, 3 and 4, were filed. The amendments concern restrictions concerning the parameters M, R and X, which are regarded as allowable.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-6	YES
	Claims		NO
Inventive step (IS)	Claims	1-6	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-6	YES
	Claims		NO

2. Citations and explanations

1. The application relates essentially to the cobalt-catalysed carbonylation of oxiranes which is characterized by a special catalyst system. The method defined in the amended claims was restricted in that, in addition to a conventional cobalt catalyst, it comprises a further component which is described by the general formula " Mx_xR_{n-x} ", wherein M stands for aluminium, magnesium or zinc and X stands for chlorine, bromine, iodine, sulfonate, oxide, C_1 - C_{32} -alkoxides or amide. The other claims relate to the catalyst system *per se*, methods for producing the same, and the use thereof.

The relevant prior art is cited in the international search report (ISR).

D1: GETZLER Y D Y L ET AL: 'SYNTHESIS OF BETA-LACTONES: A HIGHLY ACTIVE AND SELECTIVE CATALYST FOR EPOXIDE CARBONYLATION' JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC, US, Vol. 124, No. 7, 2002, pages 1174-1175, XP002258049

ISSN: 0002-7863 mentioned in the application

D2: LEE J T ET AL: 'SYNTHESIS OF BETA-LACTONES BY THE REGIOSELECTIVE, COBALT AND LEWIS ACID CATALYZED CARBONYLATION OF SIMPLE AND FUNCTIONALIZED EPOXIDE' JOURNAL OF ORGANIC CHEMISTRY, AMERICAN

CHEMICAL SOCIETY, EASTON, US, Vol. 66, No. 77,
2001, pages 5424-5426, XP002258050

ISSN: 0002-3263 mentioned in the application

D3: MAHADEVAN V ET AL: '[LEWIS ACID]+[Co(CO)₄]-
COMPLEXES: A VERSATILE CLASS OF CATALYSTS FOR
CARBONYLATIVE RING EXPANSION OF EPOXIDES AND
AZIRIDINES' ANGEWANDTE CHEMIE. INTERNATIONAL
EDITION, VERLAG CHEMIE. WEINHEIM, DE, Vol. 41,
No. 15, 2002, pages 2781-2784, XP002258051
ISSN: 0570-0833 mentioned in the application

D4: MOLNAR F ET AL: 'MULTISITE CATALYSIS: A
MECHANISTIC STUDY OF BETA-LACTONE SYNTHESIS FROM
EPOXIDES AND CO-INSIGHTS INTO A DIFFICULT CASE OF
HOMOGENEOUS CATALYSIS' CHEMISTRY - A EUROPEAN
JOURNAL, VCH PUBLISHERS, US, Vol. 9, No. 6, 2003,
pages 1273-1280, XP002258052 ISSN: 0947-6539
mentioned in the application

D5: GB-A-1 020 575

D6: FURUKAWA J ET AL: 'COPOLYMERIZATION OF CARBON
MONOXIDE WITH ALKYLENE OXIDE' MAKROMOLEKULARE
CHEMIE, MACROMOLECULAR CHEMISTRY AND PHYSICS,
HUTHIG UND WEPF VERLAG, BASEL, CH, Vol. 89, 1965,
pages 263-268, XP009001879 ISSN: 0025-116X
mentioned in the application

D7: US-A-3 260 738

D8: DATABASE CROSSFIRE BEILSTEIN, XP002258053 &
KOWALCZUK M ET AL. 'SYNTHESIS OF NEW
GLYCIDYLOXYPROPIOLACTONES' POLISH JOURNAL OF
CHEMISTRY, Vol.55, No. 9, 1981, pages 1965-1967

D9: US-A-4 620 033

D10: US-A-6 084 124

D11: WO-A-02/12161

D12: WO-A-03/050154.

Documents D3, D4 and D12 were published between the
priority date and the filing date and are therefore
not prior art within the meaning of the PCT. They
are not taken into consideration in the international
preliminary examination but could, under certain

conditions, be taken into consideration in the regional phase before the European Patent Office for the assessment of novel and possibly inventive step.

2. Novelty:

The catalyst system that was restricted concerning the parameters M, R and X in amended claim 4 appears to be novel in the light of the disclaimer defined in relation to D6. None of the documents discloses catalysts which are characterized in particular by a combination of M, R and X. Novelty in relation to D1 results from the restriction of R and M. The catalyst combination explicitly excluded in claim 4 is already described as a polymerization catalyst in D6. Claim 1, which is directed to the production of lactones and includes the catalyst known from D6 in the production catalyst, is therefore likewise novel in relation to D6.

The claimed subject matter therefore appears to have complied with the novelty requirements of PCT Article 33(2).

3. The role of cobalt-containing catalysts in the carbonylation of oxiranes is already described in the prior art (see, for example, D11: page 5, where $\text{Co}(\text{CO})_4$ is mentioned as a catalytically active species). Similarly, it is generally known that the cobalt can be introduced into the reaction in different ways, because carbonyl complexes with this metal are easily formed (see, for example, D11: pages 10 to 11). Dicobaltoctacarbonyl is frequently used as the preferred catalyst in the cited literature. The technical meaning of the claimed component "B" of formula (I) is therefore that of a "promoter" for the carbonylation reaction. Until now, Lewis acids (see D1 and D2) have generally been proposed as "promoters" of this type.

Starting out from D2 (or D1) as the closest prior art, the problem which arose was that of providing an alternative method for producing lactones which is, if necessary, improved as regards the processing costs or efficiency.

The tables in the application demonstrate that a better yield compared with D2 and D1 is obtained with the claimed catalyst system. The problem is therefore considered to be solved.

A person skilled in the art seeking to solve the problem using other catalyst systems was not taught by D1 and/or D2 that technically suitable or improved catalysts can be obtained by replacing tin, boron, fluorine, imino-containing "promoters" with other Lewis acids, such as the AlMe_3 and AlOi-Pr used as per the invention. In particular, no teaching appears to be directed to the combination of the claimed parameters M, R and X, and therefore the claimed solution does not appear to be suggested by the prior art. Consequently, the subject matter of claims 1 to 6 appears to have complied with the requirements of PCT Article 33(3).